

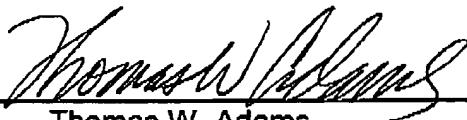
Docket No. ATOTP0100USSerial No. 09/981,587REMARKS

Applicant submits this preliminary amendment to correct grammatical errors and minor clarifications in the specification, pursuant to 37 C.F.R. 1.121(b). Entry of the amendments prior to examination of the application is requested. No new matter is included in these amendments. A version of the above-amended paragraphs marked to indicate the specific amendments may be found in the attached Appendix in accordance with 37 C.F.R. 1.121(b)(1)(iii).

In addition to the above-identified amendments, the Examiner is requested to note that on page 7, line 25, the "γ" symbol in the term "γ-butyrolactone" is the Greek letter gamma that may be more clearly recognized with a Times New Roman font as "γ."

In the event that issues arise in relation to this paper or in the prosecution of this application, Applicant requests that the Examiner telephone the undersigned attorney to expedite allowance of this application. It is believed that no fees are due with the submission of this preliminary amendment. In the event that any fees are required for the filing of this paper, the Commissioner is authorized to charge those fees to Deposit Account #18-0988, Docket No. ATOTP0100US.

Respectfully submitted,
RENNER, OTTO, BOISSELLE & SKLAR, LLP

By 
Thomas W. Adams
Reg. No. 35,047

1621 Euclid Avenue
Nineteenth Floor
Cleveland, Ohio 44115-2191
Telephone (216) 621-1113
Facsimile (216) 621-6165



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The following is a version of the above-amended paragraphs marked to indicate the specific amendments. Added matter is underlined and deleted matter is shown in [brackets].

At page 2, lines 18 - 22 the following amendment has been submitted.

In one embodiment, the aqueous silver salt solution is at a pH in the range from about 6 to about 9. In one embodiment, the non-conductive surface is contacted with a conditioner prior to contacting with the stannous salt. In one embodiment, the non-conductive surface is modified prior to contacting with the stannous salt, or prior to the conditioning treatment.

At page 5, lines 14 - 19 the following amendment has been submitted.

In one embodiment, the method includes cleaning the non-conductive substrate. In a typical cleaning, the surface of a non-conductive substrate to be treated is cleaned to remove deposits such as fingerprints, fats and oils and like organic substances, and/or dust deposited due to electrostatic action. Conventional degreasing agents can be used as a treating solution. For example, an alkaline degreasing agent or the like may be used.

Beginning on page 5, line 20 and ending on page 6, line 2 the following amendment has been submitted.

In one embodiment, a physical/chemical pretreatment for surface modification of the non-conductive substrate is applied prior to application of the method of the present invention. The surface modification results in a roughened surface having an increased surface area and having an increased susceptibility to attachment of metal ions in subsequent treatment steps. The surface modification pretreatment is intended to enhance attachment of metals in the subsequent steps. The surface modification treatment may include, for example, a solvent swell, a chromic acid etch, a non-chromic acid etch, a plasma treatment, or other known processes for surface preparation, such as lamination and removal of a roughened metal layer from [onto] the non-conductive substrate.



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At page 7, lines 1 - 6 the following amendment has been submitted.

In one embodiment, the surface modification includes treatment with a solvent which causes the surface of a polymeric non-conductive material to swell and become easier [easy] to etch. This may be especially desirable when employing those polymeric materials that are inherently hydrophobic and/or have a very low surface porosity such as various polyimides, including the polyetherimides.

At page 7, lines 13 - 21 the following amendment has been submitted.

The choice of solvent depends to some degree on the specific polymeric non-conductive material which is to be metallized. Suitable solvents are known in the art, and may be appropriately selected. Suitable solvents include, for example, glycol ether esters such as [or] acetates, N-alkyl pyrrolidones, aliphatic alcohols, aliphatic amines, alkali metal hydroxides, butyl and ethyl Cellosolve® (butyl is 2-butoxy ethanol), butyl Carbitol® (2-(2-butoxyethoxy)ethanol), and ethylene glycol. Other useful solvents include 2-butoxy ethyl acetate (EBA), propylene glycol monomethyl ether (Dowanol PM), and propylene glycol monomethyl ether acetate (Dowanol PMA).

Beginning on page 9, line 26 and ending on page 10, line 8 the following amendment has been submitted.

In one embodiment, in the conditioning step, a neutralizer comprising an acid salt of a reducing agent is applied to the non-conductive substrate. The reducing agent may be one or more of hydrazine, which may be present as a derivative such as hydrazine hydrate, hydrazine sulfate, neutral hydrazine sulfate or hydrazine maleate, hydroxylamine, mono-, di- or tri-ethanolamine, glyoxylic acid, aldehydes such as formaldehyde, benzaldehyde, [formalin], glyoxal, vanillin or acetaldehyde, hypophosphite, hydrogen borate such as NaBH₄ or KBH₄, N-dimethylamine borane (DMAB), N-diethylamine borane (DEAB), sodium thiosulfate, sodium ascorbate, monosaccharide, disaccharide or polysaccharide, for example, sucrose. The acid of the acid salt of a reducing agent may be a mineral acid such as hydrochloric, sulfuric or phosphoric, or it may be a sulfonic acid, or it may be a carboxylic acid.



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At page 10, lines 18 - 21 the following amendment has been submitted.

In one embodiment, in the conditioning step, a conditioner comprising at least one surfactant and at least one aliphatic amine is applied to the non-conductive substrate. In one embodiment, the at least one surfactant is one or more [or a combination] of nonionic, anionic, cationic or amphoteric surfactants.

Beginning on page 10, line 27 and ending on page 11, line 2 the following amendment has been submitted.

In one embodiment, a combination or mixture of a neutralizer and a conditioner, each as described above, is [are] applied to the non-conductive surface. In one such embodiment, a combination of Futuron® Neutralizer and Conditioner CC-301 are employed. In another such embodiment, a combination of Futuron® Neutralizer and Futuron®-C Conditioner is employed.

Beginning on page 12, line 23 and ending on page 13, line 6 the following amendment has been submitted.

The present inventor has discovered that, contrary to prior art teachings in which silver ion had been found to be generally unsatisfactory as a catalyst for electroless plating of a non-conductive substrate, under proper conditions silver provides excellent results in such an application. In the prior art, when silver was used in such catalyzing applications, the silver ion was present in an acidic medium. The present inventor has discovered that when silver ion is present in a solution having a pH in the range from about 5 to about 10, excellent catalysis for electroless plating is obtained. In one embodiment, the solution has a pH in the range from about 6 to about 9. The present inventor has discovered that[,] the pH should not be acidic, e.g., below about pH 5, and the pH should not be increased to such a level that the silver becomes photosensitive, e.g., above about pH 10. Thus, an alkaline silver solution at a pH above about pH 10 would be unsatisfactory.

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Beginning on page 18, line 8 and ending on page 19, line 5 the following amendment has been submitted.

In one embodiment, an electroless silver layer is applied in the electroless plating step. In one embodiment, the electroless silver layer is applied by a method described in U.S. Patent No. 5,645,628 ('628 patent). The method of the '628 patent employs an electroless plating bath, comprising a silver material containing silver ions; a reducing agent for [of] the silver ions which contains no metal in the chemical formula thereof; a complexing agent for [of] the silver ions which contains no metal in the chemical formula thereof; and a pH control agent which contains no metal in the chemical formula thereof. The '628 patent discloses that the method is also useful for the electroless application of copper, nickel, cobalt, palladium and gold. The '628 patent discloses that the reducing agent comprises at least one substance selected from the group consisting of tartaric acid, tartrate containing no metal in the chemical formula thereof, monosaccharide, disaccharide, polysaccharide, hydrazine, a hydrazine derivative, aldehyde and polyol. The '628 patent discloses that the complexing agent for silver and copper comprises at least one substance selected from the group consisting of ethylenediamine, an ethylenediamine derivative, ammonia and triethanolamine. The '628 patent discloses that the ammonium salt and ammonia pH control agents are useful for adjusting the pH of silver and copper electroless plating solutions, with tetramethylammonium hydroxide (TMAH) preferred for use with silver. For silver plating, the '628 patent discloses that the reducing agent is preferably tartaric acid, the complexing agent is preferably ethylenediamine, and the pH control agent is preferably TMAH. The '628 patent discloses that the silver may be deposited by electroless plating at a pH of about 10. The entire disclosure of the '628 patent relating to electroless plating solutions is incorporated herein by reference. Other known electroless silver deposition methods compatible with the present invention may be used within the scope of the present invention.

At page 23, lines 18 - 23 the following amendment has been submitted.

Material	[Composition-II]
Silver Nitrate	500 mg/liter
Methane sulfonic acid (70%)	none
Triethanolamine	2 ml/liter
D. I. water	Balance
pH	~8.0

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At page 24, lines 29 - 30 the following amendment has been submitted.

Good uniform metal coverage is observed in all four cases. No copper plating is observed on the plastisol rack coating.

At page 25, lines 24 - 30 the following amendment has been submitted.

Good electroless copper deposition is observed in all the cases. In the case of ABS/PC blend, polypropylene, polyphenyleneoxide and epoxy-glass, the test plaques processed through conditioner CC-301 show more rapid initiation of copper plating and somewhat better plating coverage than those processed without the conditioner CC-301. Plating initiation and coverage on ABS plastic is almost the same in both conditions. No plating is observed on the plastic rack coating in either case.

At page 27, lines 2 - 13 the following amendment has been submitted.

After appropriate pre-treatment (see note below), test plaques of engineering plastics NORYL® MX5553 (modified polyphenylene ether), ULTEM® 1010-1000 (polyether imide), carbon filled PEEK (polyether ether ketone), SUPEC® G301RA (polyphenylene sulfide), SEQUEL® 1440 (TPO from Solvay) and AMODEL® ET-1002L (modified polyphthalamide) are [were] processed through etching and reducing steps. Such etched parts are then processed through conditioner CC-301/HC F45, a mixture of two Atotech conditioner products (a blend of cationic, non-ionic and amphoteric surfactants) followed by sensitizing, catalyzing and electroless copper plating steps as described in Example 4. Good electroless plating coverage is obtained within 3 minutes of plating in all cases except NORYL® MX 5553, for [in] which about 10 minutes is [was] taken to obtain complete coverage due to slow initiation.

At page 29, lines 9 - 22 the following amendment has been submitted.

ABS, ABS/PC and polypropylene test plaques are first etched in the chromic acid etch, rinsed and treated in the chromic reducer step with Futuron Neutralizer and rinsed. Such treated samples are then processed through Futuron C conditioner (0.5% in 2% hydrochloric acid) and then further treated in the following sensitizer and catalyst steps:

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Sensitizer: SnCl_2 200 g/l and HCl (concentrated) 100 ml/l

Rinse (deionized water)

Catalyst: Aqueous AgNO_3 solution: Ag ions 150 mg/l; pH ~6.5

Rinse (tap water)

Such catalyzed samples are plated in COPPERSHIELD® LT (Atotech USA) electroless copper plating bath for 10 minutes at 35°C. Good copper plating is observed in all cases.

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